Architectural Science 2

* Light

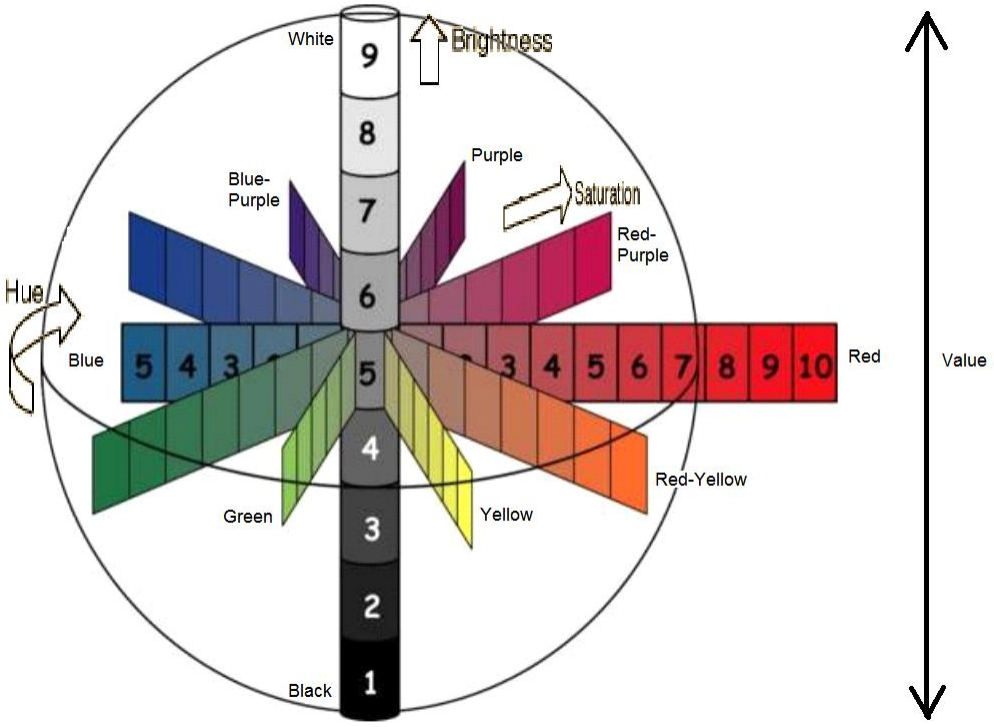
* Noise

* Light

Two light sources

* Natural - FOC

* Artificial - User's control



Munsell Colour Wheel

Characterises colours by 3 categories:

Hue: 100 equally spaced hues around the circle.

Saturation: Units of chroma starting at 0 and increasing up to 10 to 18 depending on hue. Some hues

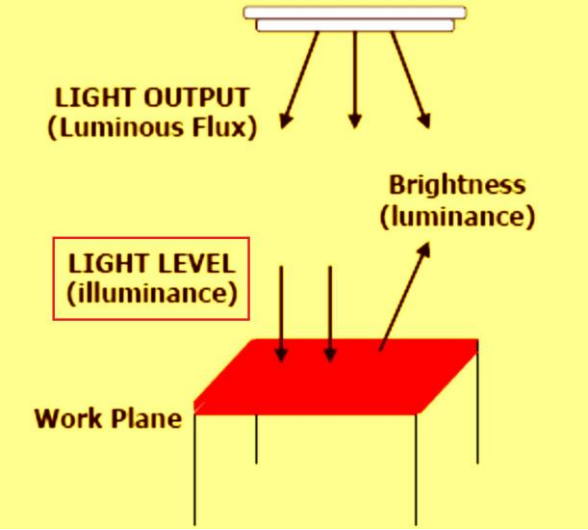
have more distinguishable levels of saturation.

Brightness: Value from 0 for black to 10 for white.

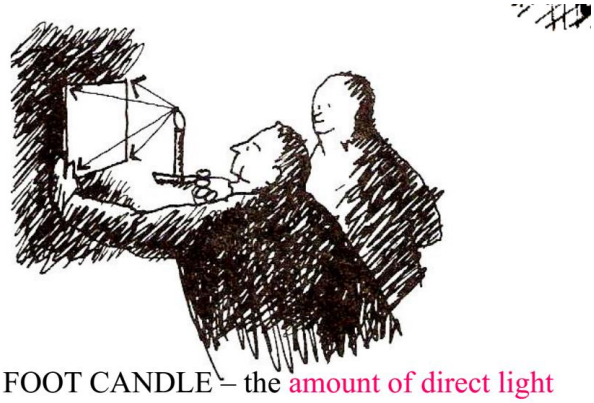
TERMINOLOGIES

It starts from one 'standard' candle...

LIGHT LEVEL, ILLUMINANCE (E)



Unit : FOOTCANDLE (fc)



FOOT CANDLE – the amount of direct light from one 'standard" candle falling on a square foot of white surface one foot away.

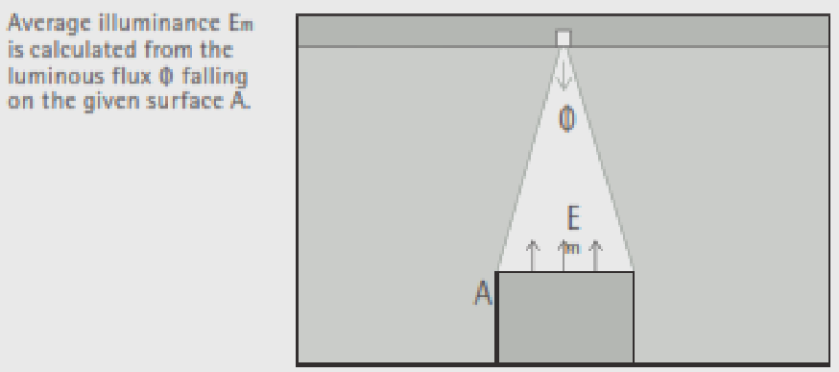
FOOTCANDLE = Direct light from one 'standard' candle one foot away
foot^2 area (white surface lighted by candle)

Standard unit: FOOTCANDLE (fc)

SI unit : LUX (lx)

1 fc = 10 lx

ILLUMINANCE (E) in other words = Density of illumination flux

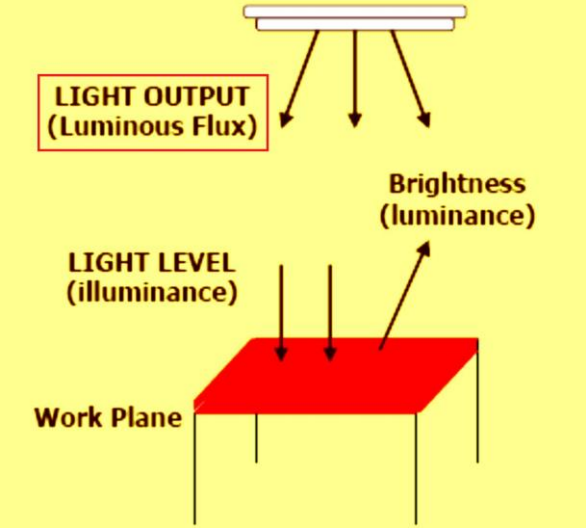


Illuminance = luminous flux (Φ)

$foot^2$ or m^2

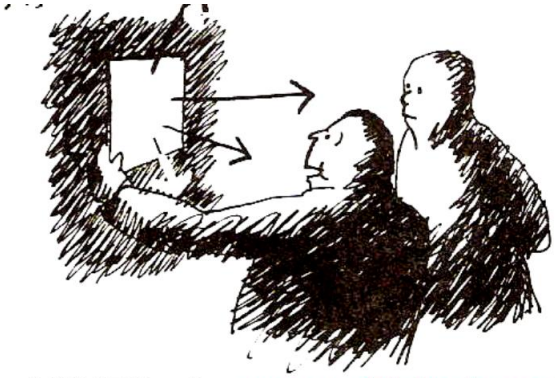
LIGHT OUTPUT, LUMINANCE (Luminous flux)

Means: Measure of the precieved power of light



An ideal point- source lamp radiates luminous flux uniformly into the space in all directions – its luminous intensity is the same in all directions.

Unit : LUMEN (lm)



LUMEN – the amount of light given off by a standard one square area.

*The **spectral sensitivity of the eye** towards the light source is measured in lumen (lm)...*

*lumen - a unit of **flux (the act of flowing; a continuous moving on) of light***

LUMEN = Amount of light output (refer to 'Brightness' in Munsell Colour Wheel)
standard area of the light output (m^2)

Standard and SI unit is lumen (lm)

LUX - The SI unit of illuminance. 1 Lux = 1 lumen per square metre.

If 10 fc (footcandle)= 1 Lux,

1 Lux = 1 lumen (amount of light given off)
m^2

Dir. light from one 'standard' candle one foot away ÷ 10 = *1 lumen (amount of light given off)*
$foot^2$ area (white surface lighted by candle)
m^2

Before going to luminance (L) we will describe to you what is luminous intensity (I) first...

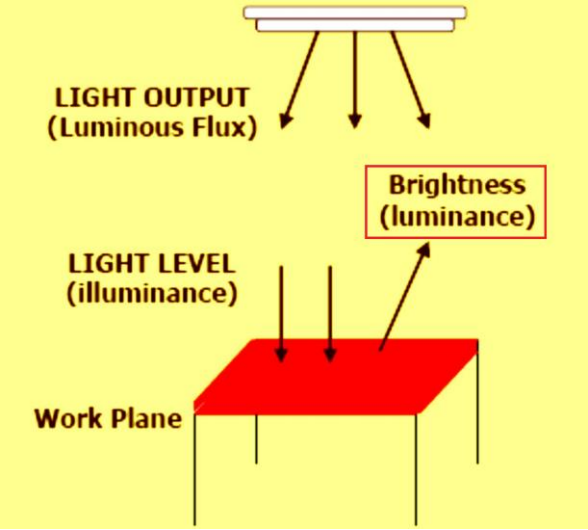
LUMINOUS INTENSITY (I)
Describes the light output of a source in a given direction. (Unit: Candela)

Luminous Intensity :

- An ideal point- source lamp radiates luminous flux uniformly into the space in all directions – its luminous intensity is the same in all directions.
- **Spatial distribution** of luminous flux, i.e. the luminous intensity distribution of the light source.
- Measuring unit is **candela (cd) or lux.**

Candela (cd) : SI unit of luminous intensity approx. one candle power

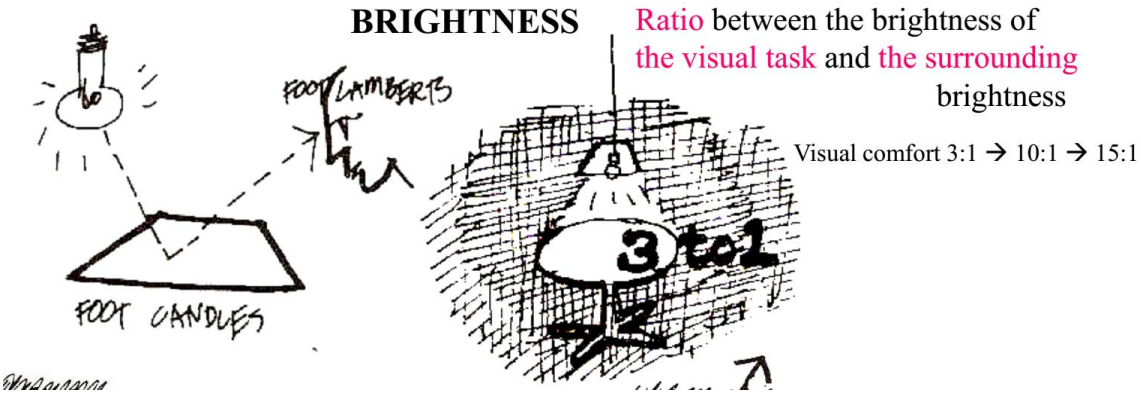
LUMINANCE (Brightness) (L)



UNIT : Candela/sq. foot (cd/m^2)

Above is considering the unit of lumen (lm) or lux (lx)

Below is considering the object and the environment (only approximate) are calcuated...


BRIGHTNESS
Ratio between the brightness of the visual task and the surrounding brightness
Visual comfort 3:1 → 10:1 → 15:1
FOOT LAMBERTS
FOOT CANDLES
3 to 1

LAMP EFFICACY

$$= \frac{\text{LUMINOUS FLUX OUTPUT (LUMENS)} \quad \text{lm}}{\text{ELECTRICAL POWER CONSUMED (WATTS)} \quad \text{w}}$$

Efficacy: The quality of being able to produce the result that was intended

High efficacy: low energy cons., low running cost, less air pollution (from power plants), less grenhouse gas emissions (from power plants)

EXPOSURE = Illuminance (fc or (fc x 10)lx) **X** amount of time exposed

Luminaires : another word for artificial light

Illumination : Lighting provided by a lamp

Illuminate : To make a light shine on something

Illuminated : Lit up by lights

Reflectance = Radiation as of light, reflected by a surface **:** Radiation incident on the surface (r)

Absorbance, optical density

Absorbance (a) *– a logarithmic measure of the amount of light that is absorbed when passing through a substance to absorb light of a given wavelength; optical density*

Transmittance (t) *– is the fraction of incident light (electromagnetic radiation) at a specified wavelength that passes through a sample.*